

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1 – 29. (Cancelled).

30. (New) A method for estimating (i) at least one of first and second electrical parameters and (ii) a spatial coordinate of a boundary separating first and second regions in a heterogeneous subterranean formation, the method comprising:

(a) obtaining a plurality of measured electrical signals that have penetrated the heterogeneous subterranean formation, the electrical signals representative of properties of the subterranean formation;

(b) comparing said measured electrical signals to a model that estimates said measured electrical signals as a function of the first electrical parameter, the second electrical parameter, and the spatial coordinate; and

(c) assigning a value to the first electrical parameter and the spatial coordinate such that the model generates estimated electrical signals that are substantially equal to the measured electrical signals, wherein said assigned value for the first electrical parameter is substantially insensitive to the second electrical parameter.

31. (New) The method of claim 30, wherein (c) further comprises assigning a value to the second electrical parameter.

32. (New) The method of claim 30, further comprising:

(d) transforming the second electrical parameter into a variable that depends on the first electrical parameter.

33. (New) The method of claim 30, wherein the first electrical parameter comprises a resistivity and the second electrical parameter comprises a dielectric constant

34. (New) The method of claim 30, wherein the second electrical parameter comprises a resistivity and the first electrical parameter comprises a dielectric constant

35. (New) The method of claim 30, wherein the measured electrical signals include an attenuation measurement and a phase shift measurement.

36. (New) The method of claim 30, wherein:

the model is a transformation that maps the first and second electrical parameters and the spatial coordinate to a vector representative of the measured electrical signals; and

(c) further comprises applying an inverse of the transformation to the measured electrical signals.

37. (New) The method of claim 30, wherein (c) further comprises applying a first mathematical transformation to the measured electrical signals and a second mathematical transformation to the estimated electrical signals generated by the model.

38. (New) The method of claim 37, wherein the first mathematical transformation yields a result that is relatively sensitive to the first electrical parameter and relatively insensitive to the second electrical parameter;

39. (New) The method of claim 37, wherein the second mathematical transformation yields a result that is relatively sensitive to the first electrical parameter and relatively insensitive to the second electrical parameter;

40. (New) The method of claim 30, wherein (c) further comprises assigning values to the first electrical parameter in each of the first and second regions.

41. (New) The method of claim 30, wherein the first region comprises an invaded zone, the second region comprises essentially virgin formation, and the spatial coordinate comprises a radius of the invaded zone.

42. (New) The method of claim 30, wherein (a) further comprises obtaining the plurality of measured electrical signals at each of a plurality of frequencies.

43. (New) The method of claim 42, wherein (c) further comprises assigning distinct values to the first electrical parameter at each of the plurality of frequencies.

44. (New) The method of claim 30, wherein (b) and (c) further comprise iterative forward modeling.

45. (New) A method for estimating first and second electrical parameters and a spatial coordinate of a boundary separating first and second regions in a heterogeneous subterranean formation, the method comprising:

(a) obtaining a plurality of measured electrical signals that have penetrated the heterogeneous subterranean formation, the electrical signals representative of properties of the subterranean formation;

(b) comparing said measured electrical signals to a model that estimates said measured electrical signals as a function of the first and second electrical parameters and the spatial coordinate; and

(c) assigning values to the first and second electrical parameters and the spatial coordinate such that the model generates estimated electrical signals that are substantially equal to the measured electrical signals, wherein said assigned value for the first electrical parameter is substantially insensitive to said assigned value for the second electrical parameter.

46. (New) The method of claim 45, wherein the first electrical parameter comprises a resistivity and the second electrical parameter comprises a dielectric constant

47. (New) The method of claim 45, wherein the measured electrical signals include an attenuation measurement and a phase shift measurement.

48. (New) The method of claim 45, wherein:
the model is a transformation that maps the first and second electrical parameters and the spatial coordinate to a vector representative of the measured electrical signals; and

(c) further comprises applying an inverse of the transformation to the measured electrical signals.

49. (New) The method of claim 45, wherein (c) further comprises applying a first transformation to the measured electrical signals and a second transformation to the estimated electrical signals generated by the model.

50. (New) The method of claim 45, wherein (c) further comprises assigning values to the first and second electrical parameters in each of the first and second regions.

51. (New) The method of claim 45, wherein the first region comprises an invaded zone, the second region comprises essentially virgin formation, and the spatial coordinate comprises a radius of the invaded zone.

52. (New) The method of claim 45, wherein (a) further comprises obtaining the plurality of measured electrical signals at each of a plurality of frequencies.

53. (New) The method of claim 52, wherein (c) further comprises assigning distinct values to at least one of the first and second electrical parameters at each of the plurality of frequencies.

54. (New) The method of claim 45, wherein (b) and (c) comprise iterative forward modeling.

55. (New) A method for estimating (i) at least one of first and second electrical parameters and (ii) a spatial coordinate of a boundary separating first and second regions in a heterogeneous subterranean formation, the method comprising:

(a) obtaining a plurality of measured electrical signals that have penetrated the subterranean formation, the electrical signals representative of properties of the subterranean formation;

(b) evaluating a model to obtain estimated electrical signals as a function of the first electrical parameter and the spatial coordinate;

(c) applying a first mathematical transformation to the measured electrical signals to obtain a first result, the first result being relatively sensitive to the first electrical parameter and relatively insensitive to the second electrical parameter;

(d) applying a second mathematical transformation to the estimated electrical signals to obtain a second result, the second result being relatively sensitive to the first electrical parameter and relatively insensitive to the second electrical parameter; and

(e) assigning values to the first electrical parameter and the spatial coordinate such that the first result obtained in (c) and the second result obtained in (d) are substantially equal.

56. (New) The method of claim 55, wherein the first electrical parameter comprises a resistivity and the second electrical parameter comprises a dielectric constant.

57. (New) The method of claim 55, wherein the measured electrical signals comprise an attenuation measurement and a phase shift measurement.

58. (New) The method of claim 55, wherein (e) further comprises assigning values to the first electrical parameter in each of the first and second regions.

59. (New) The method of claim 55, wherein the first region comprises an invaded zone, the second region comprises essentially virgin formation, and the spatial coordinate comprises a radius of the invaded zone.

60. (New) The method of claim 55, wherein (a) further comprises obtaining the plurality of measured electrical signals at each of a plurality of frequencies.

61. (New) The method of claim 55, wherein:

(b) further comprises evaluating the model as a function of the second electrical parameter, the second electrical parameter being transformed into a variable that depends on the first electrical parameter.

62. (New) The method of claim 55, wherein:

the first mathematical transformation assumes that each property of the measured electrical signal senses the first and second electrical parameters in different volumes of the subterranean formation.; and

63. (New) The method of claim 55, wherein:

the second mathematical transformation assumes that each property of the estimated electrical signal senses the first and second electrical parameters in different volumes of the subterranean formation.

64. (New) The method of claim 55, wherein the first mathematical transformation is substantially identical to the second mathematical transformation.

65. (New) The method of claim 55, wherein no dielectric assumption is made in the first transformation.

66. (New) A method for estimating (i) at least one of first and second electrical parameters and (ii) a spatial coordinate of a boundary separating first and second regions in a heterogeneous subterranean formation, the method comprising:

(a) obtaining a plurality of measured electrical signals that have penetrated the subterranean formation, the electrical signals representative of properties of the subterranean formation;

(b) evaluating a model to obtain a plurality of estimated electrical signals as a function of the first electrical parameter and the spatial coordinate;

(c) applying a first mathematical transformation to the plurality of electrical signals to obtain a first result, the first transformation including a permuted dielectric assumption;

(d) applying a second mathematical transformation to the plurality of estimated electrical signals to obtain a second result, the second mathematical transformation including a permuted dielectric assumption; and

(e) assigning values to the first electrical parameter and the spatial coordinate such that the first result obtained in (c) and the second result obtained in (d) are substantially equal.

67. (New) The method of claim 66, wherein the first mathematical transformation is substantially identical to the second mathematical transformation.

68. (New) The method of claim 66, wherein the first electrical parameter comprises a resistivity and the second electrical parameter comprises a dielectric constant.

69. (New) The method of claim 66, wherein the plurality of electrical signals comprises an attenuation measurement and a phase shift measurement.

70. (New) The method of claim 66, wherein the first result is selected from the group consisting of a phase resistivity and an attenuation resistivity.

71. (New) The method of claim 66, wherein:

(c) further comprises applying a third mathematical transformation to the plurality of electrical signal to obtain a third result, the third mathematical transformation including a dielectric assumption; and

(d) further comprises applying a fourth mathematical transformation to the plurality of estimated electrical signals to obtain a fourth result, the fourth mathematical transformation including a dielectric assumption.

72. (New) The method of claim 71, wherein the first electrical parameter and the spatial coordinate are assigned in (e) such that the first result obtained in (c) and the second result obtained in (d) are substantially equal and the third result obtained in (c) and the fourth result obtained in (d) are substantially equal.

73. (New) The method of claim 71, wherein the third and fourth mathematical transformations include a permuted dielectric assumption.

74. (New) The method of claim 66, wherein (a) further comprises obtaining the plurality of measured electrical signals at each of a plurality of frequencies.

75. (New) The method of claim 66, wherein (e) further comprises assigning values to the first electrical parameter in each of the first and second regions.

76. (New) The method of claim 66, wherein the first region comprises an invaded zone, the second region comprises essentially virgin formation, and the spatial coordinate comprises a radius of the invaded zone.